Lesson 3

Leaves on forest floor

A Big Job for a Tiny Crew

Decomposers are the "cleanup crew" in any ecosystem. The digestive processes that decomposers use to "eat" make them important to humans and ecosystems. In their own quest for nutrients, decomposers not only rid the planet of "dead" material, but also make available to living plants and animals the carbon and other essential chemicals and nutrients locked up in dead tissue.

In Lesson 3, students observe evidence of decomposition and discuss steps in the decomposition process. Their observations of the process lead them to discover the important role decomposers play in an ecosystem. Students apply what they know about decomposers and scavengers as they respond to two narratives describing decomposition. Students explain the complexity of the relationship between decomposers and scavengers in food chains by drawing diagrams depicting the characters and sequence of events in the narratives. Students' diagrams of the connections between decomposers and other organisms in an ecosystem demonstrate their understanding of the role decomposers play in the nutrient cycle and the food chain.

Learning Objective

Explain the role of decomposers in an ecosystem.

Recognize that the cycles and processes involving recycling of matter and transfer of energy among organisms are essential to the functioning of natural systems (ecosystems).

Background

Decomposers contribute to ecosystems in multiple ways. They help break down "dead" matter, but they also serve as food for other consumers. Earthworms, springtails, and feather-winged beetles all feed on fungi. A variety of aquatic and terrestrial animals eat bacteria; even humans eat bacteria in cheese and yogurt. Most decomposers reproduce at astounding rates, so they make up a large part of Earth's biomass. Decomposers form the base of many food chains where producers are not available; these food chains exist in the deepest parts of the ocean or in temperatures where plants cannot survive.

Decomposers spend their time feeding primarily on dead organic matter. In doing so, decomposers accomplish two things for the ecosystem. First, they rid the planet of animal wastes, carcasses, and leaf litter by breaking them down through their metabolic processes. If decomposers did not continually feed on dead tissues, waste would overwhelm ecosystems. But there is no waste in nature, because as decomposers feed on dead tissue, they release the nutrients trapped within as byproducts of their own metabolic process. Thus, as decomposers gain the energy they need to live, they release carbon and other nutrients back into the ecosystem.

Evidence of decomposers' continuous efforts is all around us. A rotten apple, moldy bread, a soggy twig, a holey leaf, and a pile of bones are reminders of the work decomposers do in cleaning up and converting wastes into usable nutrients. Decomposers do not act alone, however; rather, they work as a "team" with scavengers. As they eat, scavengers help to break down dead matter into smaller pieces. Decomposers finish the job by chemically breaking those pieces down into their simplest components. This can happen in a number of ways. Some decomposers live inside the intestinal tract of a scavenger and break the matter down there, other decomposers feed on the scavenger's waste after the scavenger excretes it, while others feed directly on dead matter.

Caterpillars eating leaves

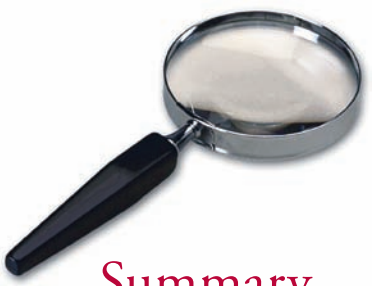
Key Vocabulary

Ecosystem: A specific area, such as a redwood forest, containing a characteristic set of interdependent species that interact with each other and the nonliving components found there.

Nutrient: A substance that provides nourishment for growth and energy to a living thing.

Waste: In a living thing, the matter, such as undigested food, that is not used by the body and is discharged.

Toolbox



Summary of Activities

Students observe evidence of decomposition and apply this concept in a discussion about the role of decomposers in ecosystems. They listen to two narratives describing decomposition and create diagrams showing decomposers and scavengers in the food web.

Instructional Support

See Extensions & Unit Resources, page 30.

Prerequisite Knowledge

Students should be able to:

- Identify characters and events in a story and use a graphic organizer to illustrate the connection between them.

Advanced Preparation

Gather and prepare Activity Masters.

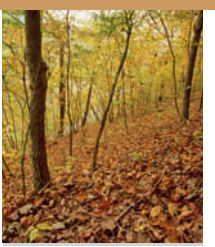
Gather and prepare Materials Needed:

- **My Decomposition Book**

Gather and prepare Visual Aids:

- Prepare transparencies.

Add to Word Wall.



Materials Needed

Activity supplies:

- Butcher paper: One six-foot sheet per class (in a light color)

A-V equipment:

- Overhead or LCD projector, screen

Class supplies:

- Colored pencils, markers, tape

Visual Aids

Transparencies:

- **Evidence of Decomposition**, Visual Aid #5–7
- **Decomposition Diagram**, Visual Aid #8

Duration

Preparation Time
30 min.
Instructional Time
50 min.

Safety Notes

None

Activity Masters in the Supporting Materials (SM)

No Activity Masters are required for this lesson.

Procedures

Vocabulary Development

Use the **Unit Dictionary** and the **Vocabulary Word Wall Cards** to introduce new words to students as appropriate. These documents are provided separately.

Step 1

Distribute students' copies of ***My Decomposition Book***. Select individual students to read aloud the new Key Vocabulary words added to the word list. Discuss the definitions as a class and have students locate the words on pages 1 and 2 in ***My Decomposition Book*** and copy the definition for each new word.

Step 2

Place one of the images in **Evidence of Decomposition** (Visual Aid #5–7) on the overhead or LCD projector. Ask students, "Which of the Key Vocabulary words you have just learned describes what this picture show?" ("*Nutrient" because that is what is inside this matter; "waste" because this is what other organisms, like humans, might throw away.*)

Ask students to share what they think is happening in the picture. (*Decomposers are feeding on the item. Scavengers may have already eaten part of it.*) Ask students what a picture of this same item would show if taken a month later. (*The photo would show less of the item—less matter—and might show more decomposers.*)

Step 3

Show the rest of the images in **Evidence of Decomposition.** With each image, ask students to describe what they see. (*Matter is being broken down—decomposed. There are decomposers or signs of decomposers and scavengers on the matter.*)

Step 4

Explain to students that, when matter decomposes, it seems to "disappear." This occurs because decomposers break down the matter into its chemical parts. Some of these chemicals are the nutrients other things need to live and grow. When plants or animals die, their tissues contain these nutrients. When decomposers feed on those tissues, the nutrients are released back into the soil, air, and water in the ecosystem. Releasing nutrients back into the ecosystem is one important thing that decomposers do for the planet.

Step 5

Ask students to guess what else scavengers and decomposers do that is important in an ecosystem. (*Answers will vary; students may mention that scavengers and decomposers are food for other animals.*) Explain that there are more scavengers and decomposers in ecosystems then all other living things combined. This is important because other animals eat them to get energy and nutrients. If there were no decomposers and scavengers, many food chains would fall apart.

Step 6

Tell students that they will now read two stories about decomposition in their ***My Decomposition Book***. The stories take place in different ecosystems, the forest and the coast. As they read each story, students will label a diagram that shows what is happening in the story. To label their diagrams successfully, they will have to identify all the "characters" in the story and identify how each one fits into the decomposition process.

Step 7

Have students turn to page 6 in ***My Decomposition Book*** where they will find the story ***Decomposition in the Forest.*** Have them go to page 7, **Breaking It Down—In the Forest,** so that they can see the diagram that they will be labeling after they read the story.

Tell the students to read ***Decomposition in the Forest.*** After they have finished reading, tell them to label the events in the story on the basic drawing on page 7 of the ***My Decomposition Book.***

Project the **Decomposition Diagram** (Visual Aid #8) on the overhead or LCD projector. Point out the different "characters" and events in the story that show how decomposers and scavengers fit into the forest food web. Ask students how the nutrients in the story get into the soil and air. (*As they break down matter, decomposers released the nutrients.*) Allow students to adjust the diagrams they made on page 7 in ***My Decomposition Book***, using the information from the transparency.

Step 8

Have students turn to page 8 in ***My Decomposition Book*** where they will find the story ***Decomposition at the Coast.*** Have them go to page 9, **Breaking It Down—At the Coast,** so that they can see the diagram that they will be labeling after they read the story.

Tell the students to read ***Decomposition at the Coast.*** After they have finished reading, tell them to label the events in the story on the basic drawing on page 9 of the ***My Decomposition Book.***

Collect students' copies of ***My Decomposition Book*** to use in assessment.

Lesson Assessment

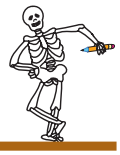
Description

The lesson teaches students that decomposers have several important roles in ecosystems and that, without them, other organisms in ecosystems could not live, eat, or grow. Students demonstrate that they recognize the importance of decomposers and scavengers and can explain their roles in ecosystems by labeling the drawing on page 9 of ***My Decomposition Book*** after they read the stories about ***Decomposition in the Forest*** and ***Decomposition at the Coast***.

Suggested Scoring

The Answer Key on pages 63–66 provides the point values for **Breaking It Down—In the Forest** and **Breaking It Down—At the Coast**. Different point values are assigned for correctly labeling different pieces of the cycle.

This variable point system helps indicate which steps of the diagram are more closely tied to the learning objective for the lesson and the purpose of this unit. For example, while being able to label the tree or the worm castings is important, it is more important that students demonstrate that they recognize that decomposers make nutrients available to the tree.



Stories of Decomposition

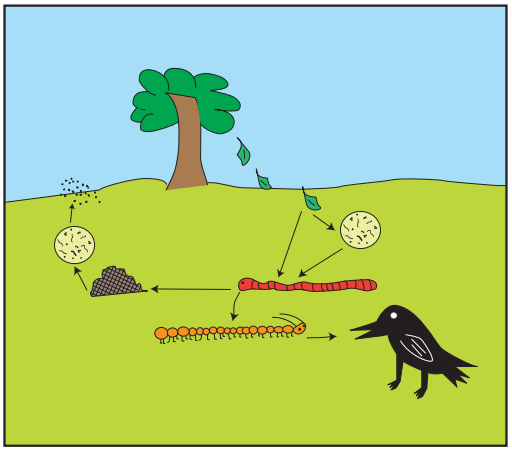
Decomposition in the Forest

A warm wind blows gently through the trees. A leaf falls from a tree to the forest floor. Bacteria from the soil move on to the leaf. They begin to feed on the leaf, breaking it down. As the bacteria get energy and nutrients from the leaf, they reproduce and grow. More bacteria begin to feed on the fallen leaf.

The leaf begins to show signs of decomposing. An earthworm breaking through the top of the soil swallows a piece of the leaf. The earthworm also swallows some soil along with bacteria and fungus living in the soil. The worm's insides grind up the leaf matter. The bacteria living in the worm's intestines help the worm digest the leaf matter. The worm gives off waste called "castings." The castings become part of the soil on the forest floor. Other bacteria and fungi begin to feed on the worm's castings.

They decompose the castings and release the nutrients in them into the soil and air. The tree takes up some of these nutrients in its roots. Plants and animals in the forest breathe in nutrients in the air. The wind blows nutrients to other ecosystems.

A centipede crawling over the fallen leaves sees the earthworm. It catches and eats the worm. Just as the centipede finishes its meal, a bluebird spies it from a tree branch above. The bluebird flies down and snatches the centipede in its beak. Then it flies back up to the branch to enjoy its meal in the warm wind blowing through the trees.



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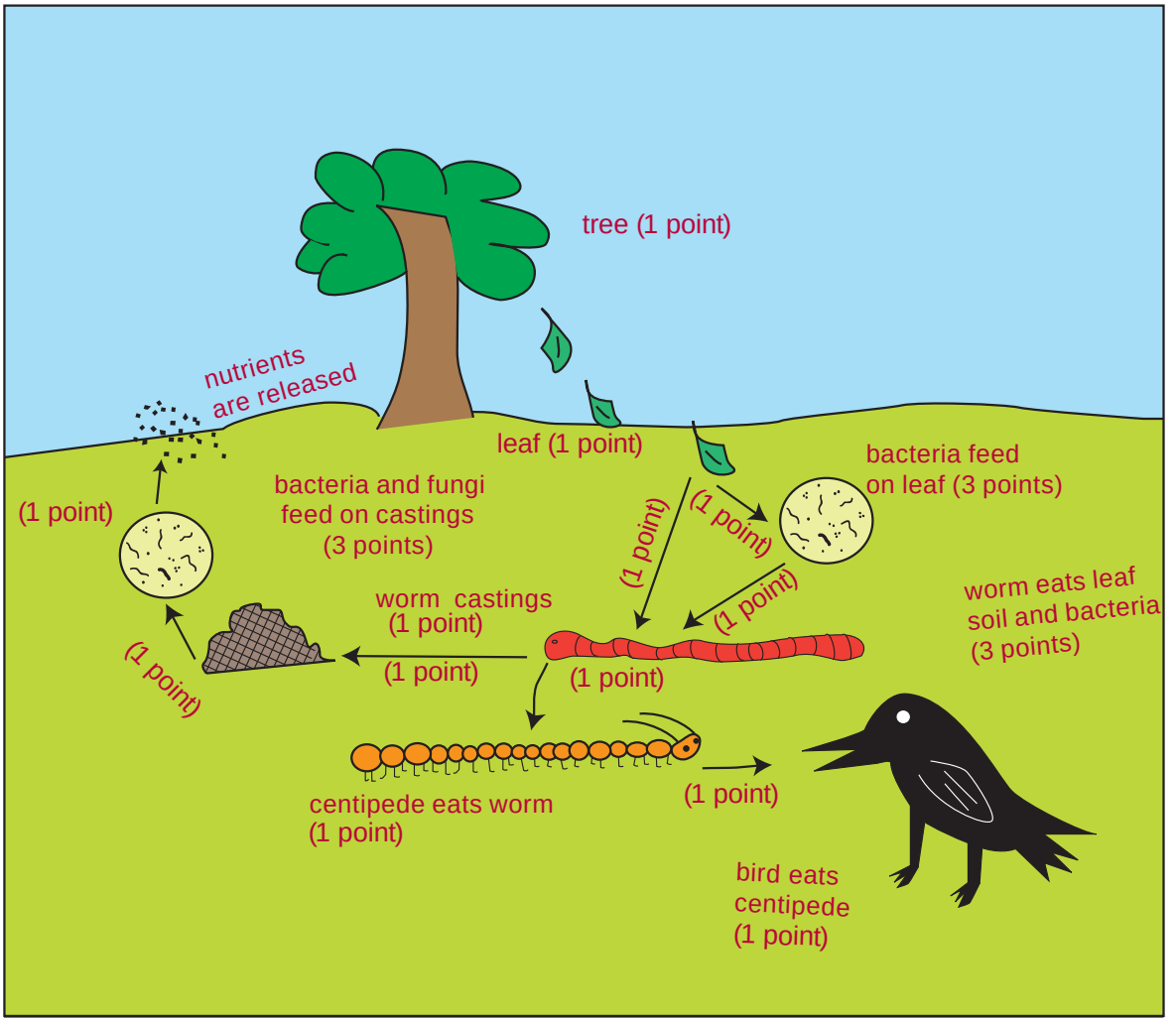
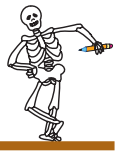
Breaking It Down—In the Forest

Use words and arrows to show how the characters in the stories are connected.

Decomposition in the Forest





Stories of Decomposition

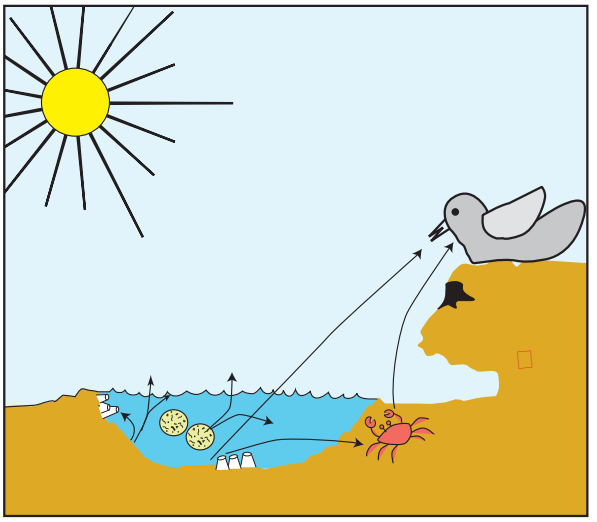
Decomposition at the Coast

As the tide comes in, a crab scampers out from under a rock. It heads over to a pool of ocean water the sun has warmed. It slips into the pool and hides in the slippery, green algae growing on the side.

The algae have been gathering energy all day. The sun and the nutrients in the pool's water are the sources of the energy. Some of the nutrients come from the rocks around the pool. Other nutrients come from the wastes of other animals and plants in the pool. Those animals and plants have been eating and decomposing all day.

The crab is not interested in the algae right now. It wants the little pieces of a fish that died in the pool earlier. Tiny plankton and barnacles in the pool have already started to feed on the fish matter. But the crab is larger and will use its claws to take some of the fish matter from them.

From the top of the nearby rock, a seagull watches the action in the pool. The gull could eat the dead fish, but the live crab looks much tastier. The seagull steps over its waste on the rock, on which bacteria have already begun to feed. It then hops down to the pool. The crab does not see the seagull's shadow until it is too late.



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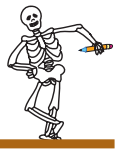
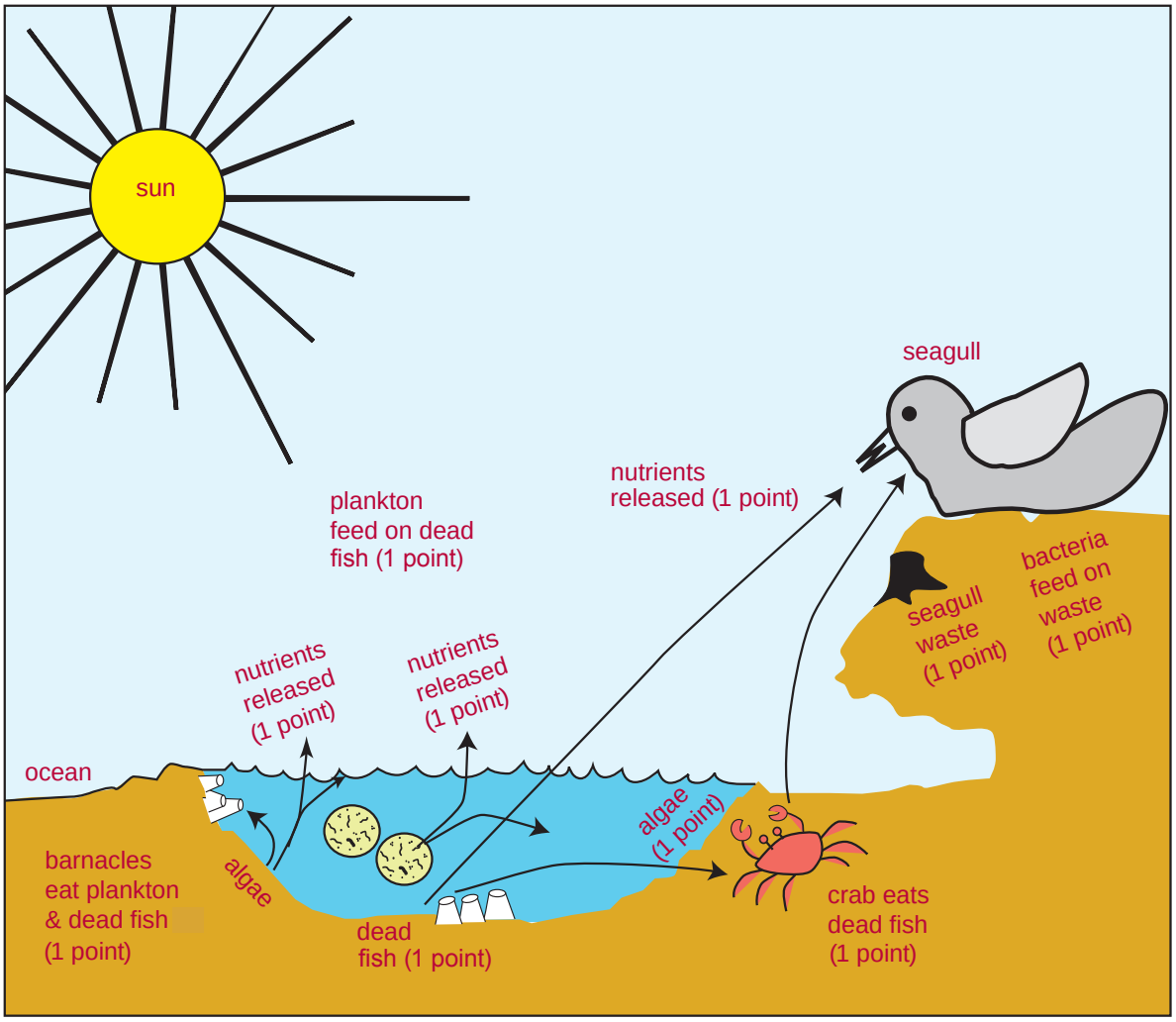
Breaking It Down—At the Coast



Use words and arrows to show how the characters in the stories are connected.

Decomposition at the Coast



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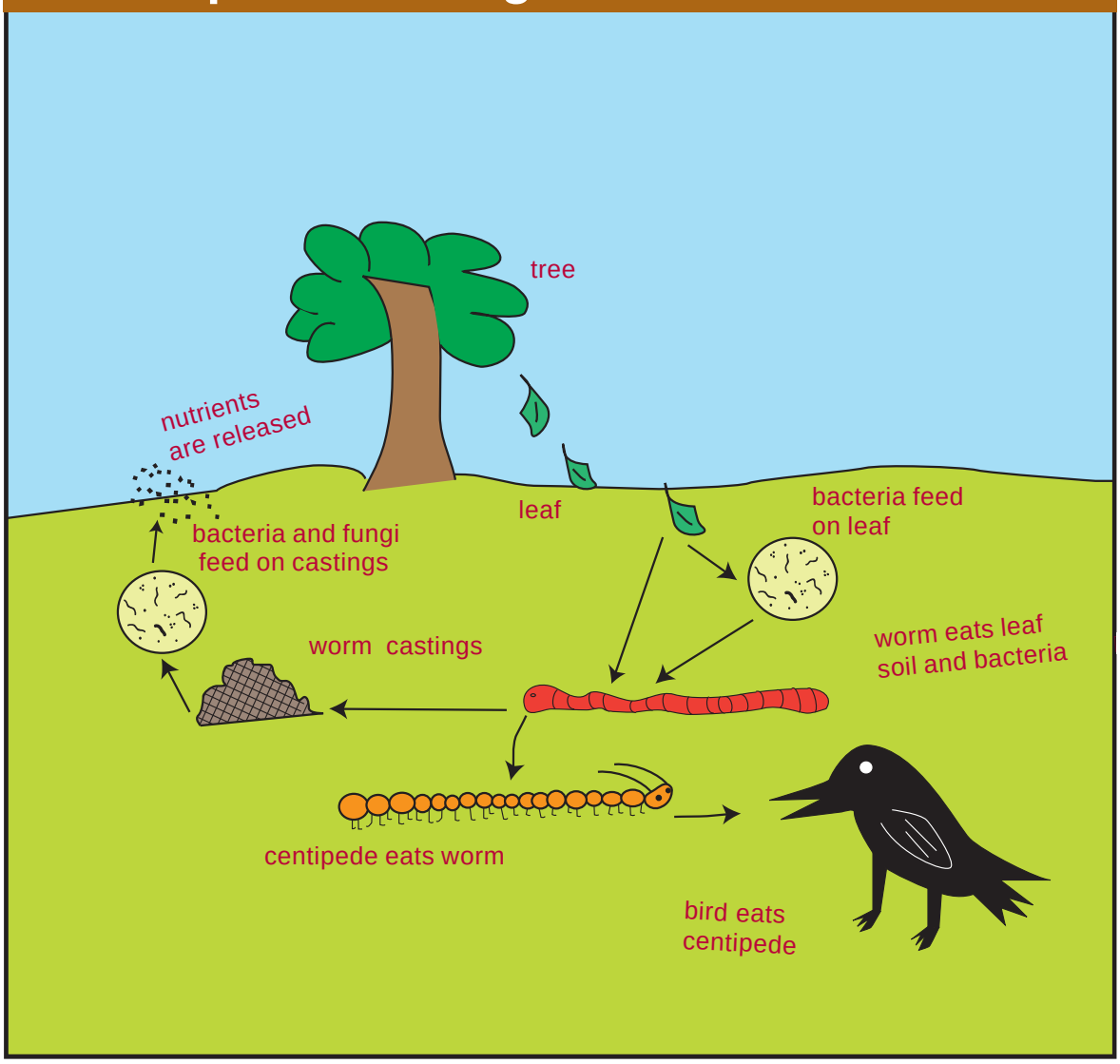
8 **Decomposition Diagram**
Visual Aid — Transparency

Decomposition Diagram



5 **Evidence of Decomposition**
Visual Aid — Transparency

Evidence of Decomposition

6 **Evidence of Decomposition**
Visual Aid — Transparency

Evidence of Decomposition

7 **Evidence of Decomposition**
Visual Aid — Transparency

Evidence of Decomposition